REMARKS

Claims 1, 2, 5, 7-11, 13-15, 21, 23, and 26-30 are pending in the application. By this amendment, claims 29 and 30 are added for the Examiner's consideration. The new claims do not add new matter to the application and are fully supported by the original disclosure. For example, support for the new claims is provided in the claims as originally filed and at page 7 of the specification. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

Allowed Claims

Applicants appreciate the indication that claim 15 contains allowable subject matter. However, Applicants submit that all of the claims are in condition for allowance for the following reasons.

35 U.S.C. §103 Rejection

Claims 1-3, 5-8, 10-11, and 16 are rejected under 35 U.S.C. §103(a) for being unpatentable over the paper "Effect of the structure on the cutability of Titanium alloys" ("Egorova") in view of U.S. Patent No. 4,415,375 ("Lederich"), U.S. Patent No. 4,505,764 ("Smickley"), U.S. Patent No. 2,892,742 ("Zwicker") and U.S. Patent No. 5,211,775 ("Fisher"). Applicants note that claims 3, 6, and 16 were previously canceled. Moreover, page 5 of the Office Action contains an explanation of a rejection of claim 13 in view of Egorova, Lederich, Smickley, and Zwicker, and Fisher. Accordingly, Applicants assume for purposes of this response that claims 1, 2, 5, 7, 8, 10, 11 and 13 are rejected in view of Egorova, Lederich, Smickley, and Zwicker, and Fisher. Clarification is requested.

Claim 9 is rejected under 35 U.S.C. §103(a) for being unpatentable over Egorova, Lederich, Smickley, Zwicker, Fisher, and further in view of and U.S. Patent No. 4,902,535 ("Garg"). Claim 14 is rejected under 35 U.S.C. §103(a) for being unpatentable over Egorova, Lederich, Smickley,

Zwicker, Fisher, and further in view of and U.S. Patent No. 2,974,021 ("Borowik"). Claims 21, 23, and 28 are rejected under 35 U.S.C. §103(a) for being unpatentable over U.S. Patent No. 5,156,807 ("Nagata") in view of U.S. Patent No. 4,512,826 ("Whang"). Claim 26 is rejected under 35 U.S.C. §103(a) for being unpatentable over Egorova in view of Zwicker and Fisher. Claim 27 is rejected under 35 U.S.C. §103(a) for being unpatentable over Egorova, Lederich, Smickley, Zwicker, and Fisher, and further in view of Whang. These rejections are respectfully traversed.

Claims 1, 2, 5, 7, 8, 10, 11 and 13

As discussed in Applicants' previous responses, the present invention relates to a method for machining a workpiece made from a titanium based alloy. More specifically, independent claim 1 recites:

> 1. A method for machining a workpiece made from a titanium-based alloy, comprising:
> removing at least one of surface oxides and further covering layers from regions of the workpiece;
> heating the workpiece to an annealing temperature of approximately 973 K in a hydrogen-containing atmosphere, wherein the workpiece takes up hydrogen, and wherein the hydrogen containing atmosphere is under a pressure of approximately 5×10^3 Pa;
> cooling the workpiece in the hydrogen-containing atmosphere;
> metal-removing machining the workpiece; and
> heating the workpiece in a hydrogen-free atmosphere, wherein hydrogen is released.

The Examiner asserts that Egorova teaches heating the workpiece in a hydrogen-containing atmosphere, cooling the workpiece in a hydrogen-containing atmosphere, metal-removing machining the workpiece, and heating the workpiece in a hydrogen-free atmosphere. The Examiner asserts that Fisher teaches removing oxide layers, that Smickley teaches hydrogen charging at a pressure of about 6.9 kPa, and that Lederich teaches hydrogen charging at temperatures between 600 and 760° C. The Examiner further contends that Zwicker teaches

cooling in a hydrogen containing atmosphere, and that the combination of the applied art teaches the claimed invention. Applicants respectfully disagree.

Particularly, Applicants submit that no proper combination of the applied art discloses or suggests *heating the workpiece to an annealing temperature of approximately 973 K in a hydrogen-containing atmosphere*. First, Applicants submit that Egorova's disclosure of hydrogen charging at temperatures between 750 – 1000°C is not approximately 973 K. Instead, 750 – 1000°C converts to 1023 – 1273 K, which is not the same as the recited approximately 973 K.

Moreover, Egorova explicitly teaches that optimal charging is achieved at 800°C (1073 K). For example, Egorova discloses at Table 4 that the "Optimum Parameters" are achieved when the temperature of hydrogen charging is 800°C. Lederich, on the other hand, teaches hydrogen charging at temperatures between 600° and 760°C. Applicants submit that although Lederich teaches hydrogen charging at temperatures between 600° and 760°C, it would not have been obvious to modify Egorova to use such temperatures. This is because Egorova has determined that for the specific alloys used (e.g., VT1-0, VT5-1, etc.), the annealing temperature of 800°C is optimal.

Thus, Applicants submit that the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose and, as such, there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Also, to this end, the Examiner has not considered the prior art reference of Egorova in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). That is, Applicants submit that modifying Egorova to use a hydrogen charging temperature of approximately 973 K would render Egorova

unsatisfactory for its intended purpose because it would result in a less than optimal cutability of the charged alloy.

Furthermore, Applicants submit that no proper combination of the applied art discloses or suggests the hydrogen containing atmosphere is under a pressure of approximately 5 x 10^3 Pa. The Examiner acknowledges that Egorova is silent as to the pressure of the hydrogen-containing atmosphere. However, the Examiner asserts that Smickley teaches hydrogen charging at a pressure of 1 psi, which is about 6.9 kPA. The Examiner concludes that the 6.9 kPA disclosed by Smickley is equivalent to the recited approximately 5 kPA, and that one would expect the same result using 6.9 kPA as using 5 kPA. Applicants respectfully disagree.

Applicants note that no reference teaches a pressure of approximately 5 x 10^3 Pa. More specifically, Applicants submit that 6.9 kPA is not approximately 5 x 10^3 Pa. In fact, the pressure disclosed by Smickley (e.g., 6.9 kPA) represents a 38% difference from the recited 5 x 10^3 Pa. Applicants submit that the term "approximately" does not include differences of 38% from the recited value. In fact, looking to the present specification, Applicants clearly recite the use of 5 x 10^3 Pa.

Moreover, Applicants disagree with the Examiner's contention that "it would have been obvious to use a pressure of 5 kPA in Egorova because one in the art would have reasonably expected that substantially the same desired result would have been achieved since this is close to the pressure (6.9 kPA) taught by Smickley)." There is simply no evidence in the record to support the allegation that using a pressure of 6.9 kPA would achieve the same result as using a pressure of 5 kPA. Instead, the Examiner is resorting to speculation and unfounded assumption in an attempt to deprecate the claimed invention.

Even further, Applicants submit that no proper combination of the applied art discloses or suggests *cooling the workpiece in the hydrogen-containing atmosphere*. The Examiner asserts that

"a cooling step would naturally flow in the process of Egorova." Notwithstanding, Applicants note that claim 1 does not recite merely a cooling step. Instead, claim 1 recites *cooling the workpiece in the hydrogen-containing atmosphere*, which refers back to the same hydrogen-containing atmosphere that the workpiece was heated in. Egorova does not disclose cooling the workpiece in the hydrogen-containing atmosphere, as recited in claim 1. Nor is such a step inherent or even implied in the teachings of Egorova.

The Examiner, apparently recognizing that Egorova does not teach *cooling the workpiece in the hydrogen-containing atmosphere*, alternatively asserts that Zwicker teaches cooling a hydrogen charged titanium alloy workpiece in a hydrogen-containing atmosphere. Applicants disagree.

Zwicker discloses that a sample "was additionally heated to 900 °C in hydrogen and permitted to cool in the oven" (col. 2, lines 41-43). This passage only states that the sample was cooled in the oven, but does not describe the atmosphere in the oven during the cooling. As there are potentially an infinite number of atmospheres that could be utilized in Zwicker's oven during the cooling, there is simply no way to tell from this description whether the oven contains the same hydrogen atmosphere that was used for heating while the sample is allowed to cool.

The Examiner also contends that the process described by Zwicker is exactly the same as Applicants' process (Office Action, pages 4 and 12). Applicants disagree. Applicants specification states that "[f]or cooling, the induction furnace is switched off and the workpiece is left to its own devices" (page 7, lines 3-4). Moreover, claim 1 explicitly recites "cooling the workpiece in the hydrogen-containing atmosphere." Therefore, Applicants claimed invention defines the apparatus (e.g., induction furnace) and the atmosphere (e.g., the hydrogen-containing atmosphere) in which the cooling takes place.

Zwicker, on the other hand, merely defines the apparatus (e.g., the oven) where the cooling takes place, but fails to define the atmosphere in which the cooling takes place. As discussed above, there are potentially an infinite number of atmospheric conditions that could be utilized inside of Zwicker's oven during the cooling step. Therefore, the process described by Zwicker is not "exactly the same" as Applicants', and it is improper for the Examiner to attribute this recited feature to Zwicker based on such flawed reasoning.

The Examiner, in the Response to Arguments section, additionally states that "atmospheric air contains a minute amount of hydrogen gas." However, Zwicker does not disclose that the oven contains atmospheric air when the sample is cooled. To the contrary, Zwicker is completely silent as to the atmosphere inside the oven during the cooling. Therefore, this note by the Examiner does not cure the deficiencies of Egorova and Zwicker with respect to claim 1. Accordingly, no proper combination of the applied art teaches *the workpiece is cooled in the hydrogen-containing atmosphere*, as recited in claim 1.

As discussed in Applicants' previous responses, Lederich, Smickley, and Fisher do not cure the deficiencies of Egorova and Zwicker with respect to claim 1, because Lederich, Smickley, and Fisher also fail to disclose or teach cooling the workpiece in the hydrogen-containing atmosphere. Therefore, no proper combination of the applied art discloses or suggests all of the features of the claimed invention.

Claims 2, 5, 7, 8, 10, 11 and 13 depend from allowable independent claim 1, and are allowable at least for the reasons discussed above with respect to claim 1. Moreover, the applied art fails to disclose or suggest many of the features recited in the dependent claims.

For example, claim 7 depends indirectly from independent claim 1, and additionally recites the vacuum is at least $2 \cdot 10^{-3}$ Pa. The Examiner admits that Egorova is silent regarding a quantitative value of the vacuum pressure, but asserts that the claimed invention would have been

obvious in view of Zwicker's teaching of a "high vacuum" at lines 46-48 of col. 2 of Zwicker. Applicants respectfully disagree.

Zwicker, like Egorova, fails to disclose or teach a quantitative value of the vacuum pressure. The phrase "high vacuum" is a relative term, and in no way teaches a vacuum of at least $2 \cdot 10^{-3}$ Pa. The Examiner acknowledges that none of the applied art discloses this feature, but asserts that such a feature would have been obvious. Applicants disagree with this factually unsupported assertion, and submit that the Examiner is improperly resorting to speculation, unfounded assumption or hindsight reconstruction to supply deficiencies in the factual basis for the rejection.

Accordingly, Applicants respectfully request that the §103 rejection of claims 1,2, 5, 7, 8, 10, 11 and 13 be withdrawn.

Claims 9, 14, and 27

Claims 9, 14, and 27 are rejected under 35 U.S.C. §103(a) as being unpatentable over Egorova and Zwicker, because Lederich, Smickley, and Fisher, and further in view of various additional combinations using references Garg (claim 9), Borowik (claim 14), and Whang (claim 27). These rejections are respectfully traversed.

Claims 9, 14, and 27 depend from allowable independent claim 1, and are allowable at least for the reasons discussed above with respect to claim 1. Moreover, the applied art fails to disclose or suggest many of the features recited in the dependent claims.

For example, no proper combination of the applied art discloses or suggests *the workpiece comprises TiAl6V4 with a lanthanum content in a range of 0.3 to 1.5 atomic%*, as recited in claim 27. Egorova does not even disclose the use of TiAl6V4, much less TiAl6V4 with lanthanum. Instead, Egorova discloses titanium alloys VT1-0, VT5-1, etc. (Egorova, methods of study section,

first paragraph). Therefore, Egorova does not teach *the workpiece comprises TiAl6V4 with a lanthanum content in a range of 0.3 to 1.5 atomic%.*

Lederich discloses a method of "superplastic forming" using TiAl6V4. However, Lederich fails to disclose or suggest the TiAl6V4 contains lanthanum. Moreover, Applicants submit that the Examiner has failed to establish that it would have been obvious to use Lederich's TiAl6V4 with the teachings of Egorova. Instead, the Examiner merely points out the Lederich discloses a claimed feature (e.g., TiAl6V4) that is absent from Egorova.

Whang teaches adding rare earth elements, including lanthanum, to certain titanium alloys. However, Whang only discloses adding lanthanum to alloys containing Ti, a IIIA metal (e.g., Al), and a IVA metal (e.g., Sn). In contrast to the claimed invention, Whang does not disclose or suggest adding lanthanum to TiAl6V4, as recited in the claimed invention. Therefore, there is no evidence to suggest that adding lanthanum to TiAl6V4 would yield predicable results.

For all of the above reasons, Applicants submit that one having ordinary skill in the art would not have been prompted to modify Egorova to use TiAl6V4 instead of VT1-0, VT5-1, etc., and then to further modify the TiAl6V4 to include a lanthanum. Therefore, no proper combination of the applied art discloses or suggests *the workpiece comprises TiAl6V4 with a lanthanum content in a range of 0.3 to 1.5 atomic%*, as recited in claim 27.

Accordingly, Applicants respectfully request that the §103 rejection of claims 9, 14, and 27 be withdrawn.

Claims 21, 23, and 28 in view of Nagata and Whang

Independent claim 21 recites:

> 21. An alloy for producing a workpiece made from a titanium-based alloy, comprising TiAl6V4 having a lanthanum content of 0.3 – 1.5 atomic%,
> wherein the lanthanum is nearly completely precipitated into precipitates of pure lanthanum devoid of oxygen and nitrogen,
> the precipitates having a mean size of 12 μm,

a distribution of the precipitates is restricted to grain boundaries and a grain interior between dendrites and a cast microstructure.

Initially, Applicants note that page 6 of the Office Action states that claims 21, 23, and 28 are rejected under §103(a) in view of Nagata and Whang. However, the explanation of the rejection makes no references to Whang, or to combining the teachings of Nagata and Whang. Therefore, Applicants request clarification of the instant rejection.

In any event, Applicants submit that no proper combination of the applied art discloses or suggests an alloy comprising TiAl6V4 having a lanthanum content of 0.3 – 1.5 atomic%, wherein the lanthanum is nearly completely precipitated into precipitates of pure lanthanum *devoid of oxygen and nitrogen.*

The Examiner asserts that as there is no disclosure of oxygen or nitrogen in the inclusions of Nagata, that it is "reasonably assumed that they are devoid of oxygen and nitrogen" (Office Action, page 7). The Examiner seems to base this assumption on a belief that Nagata forms alloys using the same method used by Applicants. Applicants respectfully disagree.

First, it is noted that rejections based on §103 must rest on a factual basis with these facts being interpreted without hindsight reconstruction of the invention from the prior art. The Office may not, because of doubt that the invention is patentable, resort to speculation, unfounded <u>assumption</u> or hindsight reconstruction to supply deficiencies in the factual basis for the rejection. *See, In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 177 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968). In this rejection, the Examiner <u>assumes</u> that Nagata's alloy has precipitates of pure lanthanum that are devoid of oxygen and nitrogen. However, this is merely an <u>assumption</u>, and is factually unsupported by the evidence.

To the contrary, Nagata teaches away from lanthanum particles that are devoid of oxygen and nitrogen, as recited in the claimed invention. For example, Nagata explicitly discloses that

oxygen is present in the three alloys (e.g., numbers 17, 41, and 42 in Table 1) that the Examiner relies on in formulating the rejection. For example, Nagata teaches that alloy 17 has 0.20 weight% of oxygen (see, e.g., Table 1). Moreover, Nagata expressly states that "[o]xygen (O) may be present in the base Ti metal or Ti alloy in an amount of not greater than 0.5%" (col. 4, lines 14-15). Even further, Nagata explicitly states that the alloy "may contain incidental impurities such as hydrogen (H) and nitrogen (N)" (col. 5, lines 48-50). Therefore, Nagata clearly states that both oxygen and nitrogen are present in the alloy. Accordingly, it is improper for the Examiner to simply assume that the lanthanum in Nagata's alloy is *nearly completely precipitated into precipitates of pure lanthanum devoid of oxygen and nitrogen*, as recited in claim 21.

Furthermore, similar to the discussion above with respect to claim 1, Applicants refute the Examiner's characterization of Applicants processes as being "the same as" that of the applied art. More specifically, Applicants submit that the process described in Applicants' specification is materially different from that disclosed by Nagata. For example, Applicants' specification states:

> The alloy TiAl6V4 with lanthanum is produced in a vacuum arc furnace. The conventional TiAl6V4 alloy is used as prealloy and is introduced into the furnace together with elemental lanthanum as a block. <u>Prior to melting, first of all a vacuum of, for example, 10^{-3} Pa is generated in order to remove oxygen from the furnace chamber</u>. The operation of striking the arc then takes place at approx. $6 \cdot 10^4$ Pa in the furnace chamber. Since titanium can only dissolve very small quantities of lanthanum at room temperature, producing the alloy gives a microstructure made up of TiAl6V4 with discrete precipitations of lanthanum particles. <u>Prior to melting down, the oxide layer in the lanthanum block has to be removed. This is done, for example, mechanically using a file with subsequent cleaning and storage in alcohol or acetone until the lanthanum is introduced into the furnace</u>. When the alloy is being melted, it is surprisingly found that the thermal conductivity of the lanthanum-containing alloy rises compared to the standard alloy, since the melt cools down significantly more quickly than the alloy without added lanthanum. To ensure that the alloy is capable of industrial application, the alloy has to be thermo-mechanically treated in order to produce a duplex microstructure. For this purpose, the alloy can be deformed, for example by extrusion, in a temperature range between 973 K and 1023 K. In the extruded state, this alloy achieves a tensile strength of approximately 1000 N/mm^2 and is therefore comparable to the base alloy TiAl6V4.

(Applicants' specification, lines 4-32 of page 10) [emphasis added].

In contrast to aspects of Applicants' invention, Nagata does not disclose or suggest generating a vacuum to remove oxygen from the furnace chamber. Also, Nagata does not disclose or suggest removing an oxide layer in the lanthanum block. In fact, Nagata explicitly teaches that both oxygen and nitrogen are present, which is different than the claimed invention. Therefore, Nagata's disclosed method is not "the same" as Applicants' process for producing TiAl6V4 with lanthanum. As such, it is improper for the Examiner to <u>assume</u> that Nagata's alloys have pure lanthanum devoid of oxygen and nitrogen based on the <u>mistaken belief</u> that Nagata and Applicants use the same method to produce alloys.

Whang does not cure the deficiencies of Nagata with respect to claim 21 because Whang also fails to disclose or suggest *an alloy comprising TiAl6V4 having a lanthanum content of 0.3 – 1.5 atomic%, wherein the lanthanum is nearly completely precipitated into precipitates of pure lanthanum devoid of oxygen and nitrogen.* As discussed above, Whang does not even teach adding lanthanum to TiAl6V4, but rather teaches adding lanthanum to other Ti based alloys. In any event, Whang does not teach precipitates of pure lanthanum devoid of oxygen and nitrogen. Nor has the Examiner asserted that Whang discloses this feature.

Therefore, no proper combination of Nagata and Whang discloses or suggests all of the features recited in claim 21, and does not render the claimed invention obvious. Claims 23 and 28 depend from allowable independent claim 21, and are allowable for at least the reasons discussed above with respect to claim 21.

Accordingly, Applicants respectfully request that the §103 rejection of claims 21, 23, and 28 be withdrawn.

Claim 26 in view of Egorova, Zwicker, and Fisher

Independent claim 26 recites:

> 26. A method for machining a workpiece made from a titanium-based alloy, comprising:
>
> removing at least one of surface oxides and further covering layers from the workpiece;
>
> after the removing, heating the workpiece in a hydrogen-containing atmosphere to an annealing temperature of at least 773 K, during which the workpiece takes up hydrogen, wherein the hydrogen-containing atmosphere is under a pressure of approximately 5×10^3 Pa;
>
> after the heating to the annealing temperature, cooling the workpiece in the hydrogen-containing atmosphere;
>
> after the cooling, metal-removing machining the workpiece; and
>
> after the machining, heating the workpiece in a hydrogen-free atmosphere, wherein the hydrogen is released.

First, Applicants note that the statement of the rejection at page 8 of the Office Action provides that claim 26 is rejected in view of Egorova, Zwicker, and Fisher. However, the body of the rejection at pages 8-10 of the Office Action assert that certain features are taught by Smickley. Applicants respectfully request clarification, and submit the next Office Action cannot be made final if the basis for the rejection is changed.

In any event, Applicants submit that no proper combination of the applied art renders claim 26 obvious. As discussed above with respect to claim 1, no proper combination of the applied art discloses or suggests the combination including, inter alia, (i) heating the workpiece in a hydrogen-containing atmosphere to an annealing temperature of at least 773 K, (ii) at a pressure of approximately 5×10^3 Pa, and (iii) cooling the workpiece in the hydrogen-containing atmosphere.

Accordingly, Applicants respectfully request that the §103 rejection of claim 26 be withdrawn.

New claims

New claims 29 and 30 are added by this amendment, and are believed to be distinguishable at least based upon its inclusion of the features of independent claims 1 and 26, respectively. Moreover, claims 29 and 30 recite *etching the workpiece after the metal removing machining and before the heating the workpiece in the hydrogen-free atmosphere*, which is not disclosed by the applied art.

For example, Fisher teaches removing oxide layers from castings after casting (see, e.g., lines 43-51 of col. 1), but not after metal removing machining and before heating the workpiece in the hydrogen-free atmosphere. Also, Borowik teaches chemical polishing and etching of titanium alloys for metallographic examination (see, e.g., lines 15-19 of col. 1), but not after metal removing machining and before heating the workpiece in the hydrogen-free atmosphere.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 19-0089.

Respectfully submitted,
Joachim ROESLER

Andrew M. Calderon
Reg. No. 38,093

February 5, 2009

GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191